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Memorandum

To: Blasting Contractors and Interested Parties

From:  Janine Commerford, Assistant Commissioner - Bureau of Waste Site Cleanup
Massachusetts Department of Environmental Protection

Subject: Potential Environmental Contamination From the Use of Perchlorate-Containing Explosive Products

Date: December 5, 2006

Introduction

The Massachusetts Department of Environmental Protection (MassDEP) has detected perchlorate in nine drinking water supplies in Massachusetts, including three public water supply wells where nearby blasting operations appear to be the source of the perchlorate contamination. The purpose of this memorandum is to provide guidance on perchlorate and prevent contamination of drinking water supplies.

Background

Perchlorate is a chemical compound comprised of 1-chlorine and 4-oxygen atoms. Ammonium perchlorate is used as a solid rocket propellant. Perchlorate compounds are found in a number of common products, including fireworks, airbag inflators, some paints and enamels, industrial chemicals, and explosives. Perchlorates are highly water soluble, and can travel significant distances in groundwater. Perchlorate can affect the function of the thyroid gland, which regulates the body's metabolism. Pregnant women and their fetuses, infants, children under the age of 12, and people with hypothyroidism are most susceptible to its potential effects. MassDEP promulgated in August 2006 a Maximum Contaminant Level (MCL) of 2 µg/l under the state drinking water regulations, 310 CMR 22, and notification criteria (Reportable Concentrations in soil and groundwater) for this contaminant under the state waste site cleanup regulations (Massachusetts Contingency Plan, 310 CMR 40.0000).

In response to detections of perchlorate in water supply wells in Massachusetts, MassDEP is investigating surrounding sites and activities that may have caused or contributed to contamination. Blasting operations employing perchlorate-containing explosives have been identified in at least three locations as the likely source of drinking water contamination.



Blasting Agents and Explosives

Perchlorates are present in a relatively small percentage of some blasting agents and explosives; primarily water gel and emulsion formulations. These products are used in difficult blasting applications, and contain sodium perchlorate, ammonium perchlorate, and/or potassium perchlorate as a sensitizing agent. Perchlorate-containing explosives typically have a high density and high explosive energy, making them suitable in wet/hard/dense rock blasting applications, or in general blasting applications to expand drilling patterns or to address excessive rock burdens. Additional situations where perchlorate-containing products are sometimes used include tight underground cuts, tight trenching applications, deep wet trenches, deep wet boreholes, and locations with high pre-compression conditions. The content of perchlorate in these products is variable, depending on the manufacturer, but can be 20% to 30% or more by weight.

Recommendations

MassDEP believes it is prudent for contractors to take the following reasonable steps to minimize potential environmental contamination:

1. **Determine the perchlorate content of blasting agents and explosives to be used.** This may require that you make inquiries with your suppliers and/or manufacturers.
2. **To the extent practical, avoid the use of perchlorate-containing explosive products when surface or groundwater can be affected, with particular attention:**
 - o Within and adjacent to the recharge areas of public drinking water supply wells (i.e., Zone II and Interim Wellhead Protection areas), and within and adjacent to the sensitive watershed areas of public drinking water supply reservoirs (i.e., Zone B areas). Maps of these areas should be available from local officials, and can be viewed on-line at <http://www.mass.gov/mgis/>
3. When the use of perchlorate-containing products is necessary:
 - o **institute rigorous "housekeeping" practices.** Some sources suggest that explosive products that are properly detonated will result in the nearly complete destruction of perchlorates, and that loss of product via spills or debris is the primary cause of environmental pollution.
 - o **take reasonable steps to prevent and address misfires.** In cases where explosives or blasting agents are washed or removed from a borehole following a misfire, reasonable efforts should be made to collect and properly manage or dispose of perchlorate-containing materials. *In all cases, the safety of workers and the general public is of paramount concern.*

Please contact Rose Knox at the MassDEP Bureau of Waste Site Cleanup (BWSC) at 617-556-1026 or Rosemary.Knox@state.ma.us if you would like additional information, or please refer to the following link on MassDEP's website: <http://mass.gov/dep/water/drinking/percinfo.htm>.